

POSTER PRESENTATION

Open Access

Expansion of mesenchymal adipose-tissue derived stem cells in a stirred single-use bioreactor under low-serum conditions

Carmen Schirmaier^{1*}, Stephan C Kaiser¹, Valentin Jossen¹, Silke Brill², Frank Jüngerkes², Christian van den Bos², Dieter Eibl¹, Regine Eibl¹

From 23rd European Society for Animal Cell Technology (ESACT) Meeting: Better Cells for Better Health Lille, France. 23-26 June 2013

Background

The need for human mesenchymal stem cells (hMSCs) has increased enormously in recent years due to their important therapeutic potential. Efficient cell expansion is essential to providing clinically relevant cell numbers. Such cell quantities can be manufactured by means of scalable microcarrier (MC)-supported cultivations in stirred single-use bioreactors.

Materials and methods

Preliminary tests in disposable-spinners (100 mL culture volume, Corning) were used to determine two suitable media and MC-types for serum reduced expansions (< 10%) of human adipose tissue-derived stem cells (hADSCs; passage 2, Lonza). Using such optimized media-MC-combinations, hADSCs expanded 30 to 40-fold, which compares well with expansion rates in planar culture. Based on computational fluid dynamics simulations and suspension analyses in spinners [1], optimal operating parameters were determined in a BIOSTAT® UniVessel® SU 2 L (2 L culture volume, Sartorius Stedim Biotech).

Results

In subsequent batch tests with the BIOSTAT UniVessel® SU 2 L, expansion rates of between 30 and 40-fold were reached and up to $4.4 \cdot 10^8$ cells with a cell viability exceeding 98% were harvested. Flow cytometry tests demonstrated typical marker profiles following cell

expansion and harvest. A 40-fold expansion rate delivered a total of $1 \cdot 10^{10}$ cells in a first cultivation with the BIOSTAT® CultiBag STR 50 L (35 L culture volume, Sartorius Stedim Biotech).

Conclusions

In summary, the foundations for successfully expanding therapeutic stem cells in truly scalable systems have been laid. Strategies ensuring expansion rates between 60 and 70-fold and, thus, generating cell amounts over 10^{10} are now in preparation.

Acknowledgements

This work is part of the project "Development of a technology platform for a scalable production of therapeutically relevant stem cells" (No. 12893.1 VOUCH-LS). It is supported by the Commission for Technology and Innovation (CTI, Switzerland). The authors would like to thank the CTI for partially financing the investigations presented.

Authors' details

¹Zurich University of Applied Sciences, Institute of Biotechnology, Biochemical Engineering and Cell Cultivation Technique, 8820 Wädenswil, Switzerland. ²Lonza Cologne GmbH, 50829 Cologne, Germany.

Published: 4 December 2013

Reference

1. Kaiser S C, Jossen V, Schirmaier C, Eibl D, Brill S, van den Bos C, Eibl R: Investigations of fluid flow and cell proliferation of mesenchymal adipose-derived stem cells in small-scale, stirred, single-use bioreactors. *Chem Ing Tech* 2013, 85:95-102.

doi:10.1186/1753-6561-7-S6-P2

Cite this article as: Schirmaier et al.: Expansion of mesenchymal adipose-tissue derived stem cells in a stirred single-use bioreactor under low-serum conditions. *BMC Proceedings* 2013 7(Suppl 6):P2.

* Correspondence: *carmen.schirmaier@zhaw.ch

¹Zurich University of Applied Sciences, Institute of Biotechnology, Biochemical Engineering and Cell Cultivation Technique, 8820 Wädenswil, Switzerland

Full list of author information is available at the end of the article